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# Cisco IoT Field Network Director

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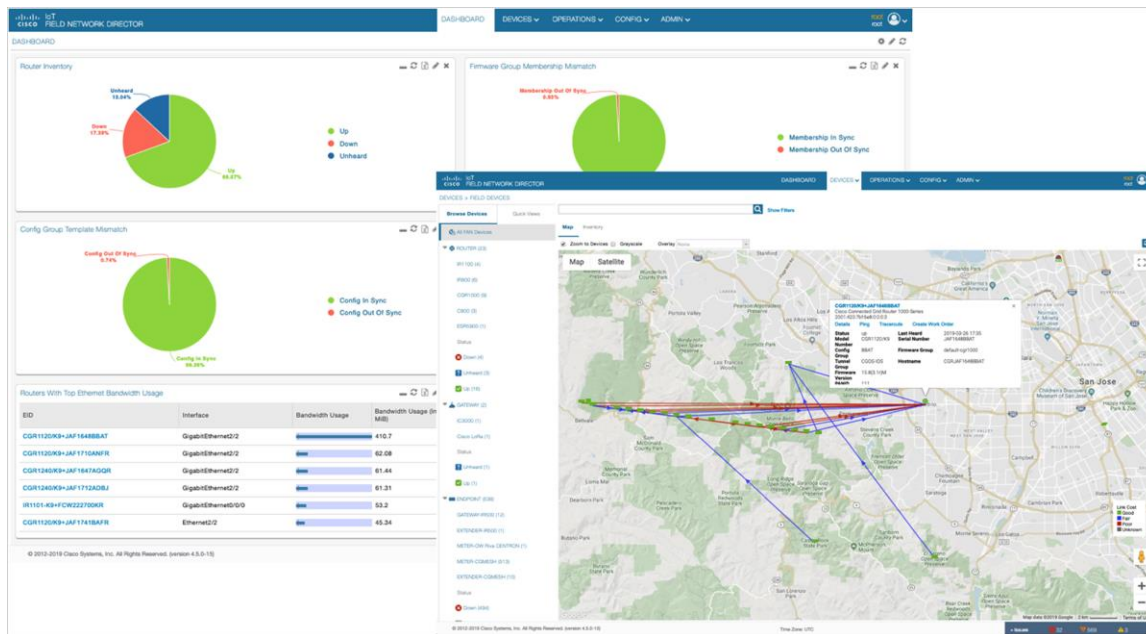
The Cisco® IoT Field Network Director (FND) is the network management system for managing multiservice Field Area Networks (FANs), which include Cisco industrial routers, connected grid routers, gateways, and endpoints.

Features that distinguish the IoT FND are as follows:

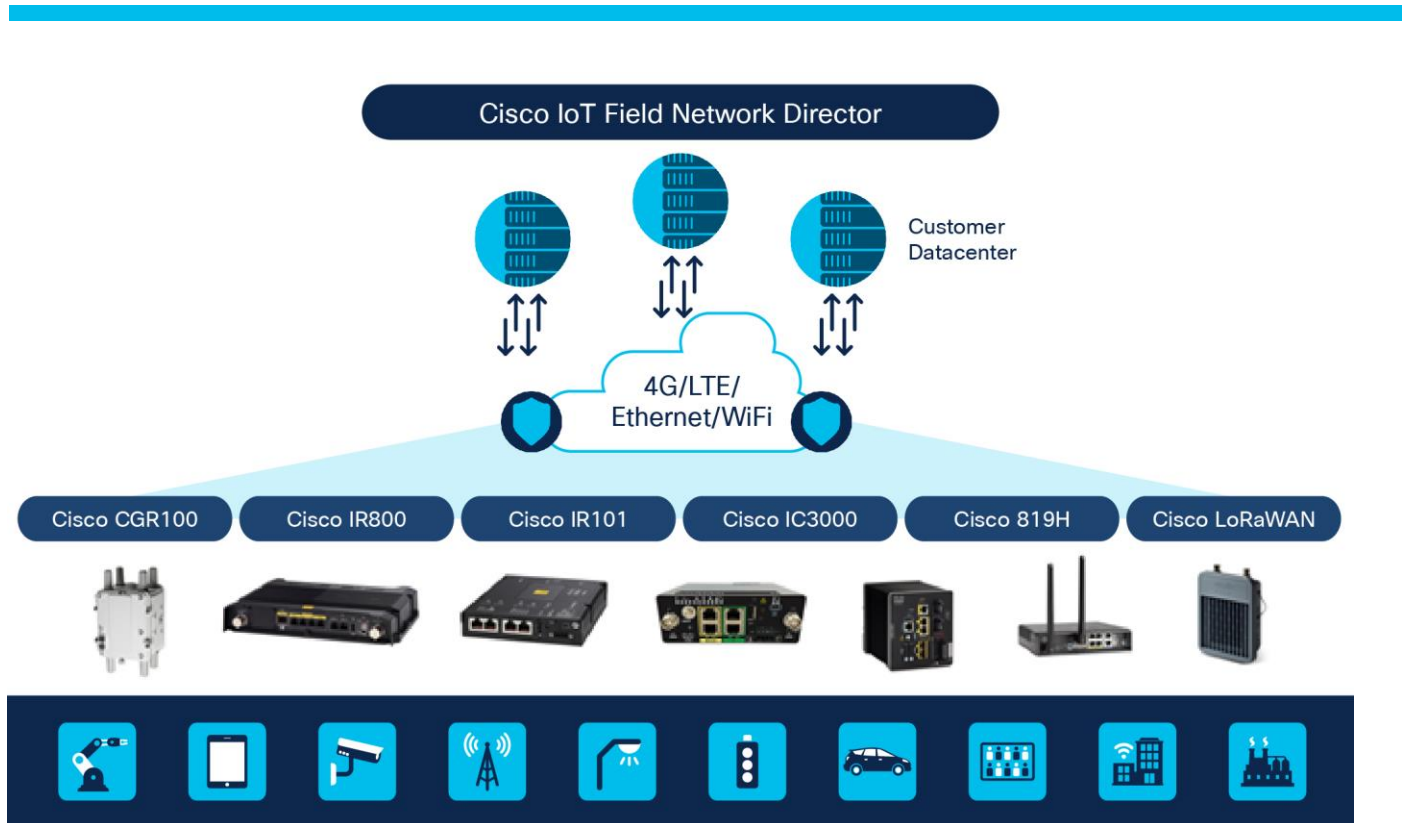
- Ease of deployment at scale with Zero-Touch Deployment (ZTD) of IoT gateways and endpoints
- Secure and scalable end-to-end enrollment and management of gateways, endpoints, and Cisco I/O applications
- Optimization to operate on a FAN with constrained bandwidth
- Enterprise visibility into the health of gateways and endpoints
- Rich set of northbound APIs for third-party application integration

IoT FND is essential to the success of Internet of Things (IoT) solution deployments: Advanced Metering Infrastructure (AMI), Distribution Automation (DA), Demand Response (DR), outdoor lighting, transportation, asset tracking, and LoRaWAN infrastructures. It is a proven system on which many of our customers rely every day to deliver critical infrastructure services to millions of their customers.

Cisco IoT Field Network Director is built on a layered system architecture to enable clear separation between network management functionality and applications in fleet management, asset tracking, and utility, such as a Distribution Management System (DMS), Outage Management System (OMS), and Meter Data Management (MDM). This clear separation between network management and applications helps customers deploy IoT projects incrementally, for example, by extending AMI into a utility's DA using a shared multiservice network infrastructure and a common network management system across various utility operations. Further, a northbound API from the IoT Field Network Director allows various applications to pull and subscribe to appropriate, service-specific network communications data from a shared, multiservice communication network infrastructure. (See Figures 1 and 2.)



**Figure 1.**  
IoT Field Network Director operator view



**Figure 2.**  
Multiservice field area network and IoT FND in the head end

## Core functionalities and supported devices

Table 1 describes IoT FND functionality, and Tables 2 through 4 list supported devices.

**Table 1.**    Functionality

<b>End-to-end security management</b>	<ul style="list-style-type: none"> <li>• Fully automated, highly secure ZTD for gateways and endpoints</li> <li>• Provisions mobile field technicians with time-bound security credentials to perform authorized field maintenance</li> <li>• Integrates with enterprise security policies and role-based access control for network devices</li> <li>• Provides device-level authentication through Authentication, Authorization, and Accounting (AAA) and RADIUS integration and alerts operators of attempted rogue device access to communication networks</li> <li>• Integrates with standard Security Information and Event Management (SIEM) to help enable security and reporting needs (NERC-CIP compliance)</li> </ul>
<b>Fault management</b>	<ul style="list-style-type: none"> <li>• Fault event collection, filtering, and correlation for communication network monitoring</li> <li>• Supports a variety of fault event mechanisms for threshold-based rule processing, custom alarm generation, and alarm event processing</li> <li>• Faults can be visualized on a color-coded GIS map view for the various gateways and endpoints</li> <li>• Allows operator-level custom fault event generation, processing, and forwarding to various applications, such as an outage management system</li> <li>• Automatic issue tracking based on events collected</li> </ul>

<b>Configuration management</b>	<ul style="list-style-type: none"> <li>• Performs over-the-air software and firmware upgrades to remote endpoints</li> <li>• Allows centralized configuration management, including change control enforced through operator role-based access control</li> <li>• Delivers flexible device grouping options, including policy-based management and methods for deploying configuration changes</li> </ul>
<b>Accounting management</b>	<ul style="list-style-type: none"> <li>• Logs access information for user activity for audit, regulatory compliance, and SIEM integration</li> <li>• Simplifies management and enhances compliance by integrating monitoring, reporting, and troubleshooting capabilities</li> </ul>
<b>Performance management</b>	<ul style="list-style-type: none"> <li>• Displays color-coded, real-time performance information on a GIS-based map</li> <li>• Monitors and collects network device status and statistics</li> <li>• Collects a standard set of metrics related to the operations network</li> <li>• Provides a powerful threshold-based rule processing engine for exception reporting and visualization on a GIS map in real time</li> <li>• Enables customized metrics collection frequency, along with historical trend reporting to suit operational needs</li> </ul>
<b>GIS map visualization, diagnostics, and troubleshooting tools</b>	<ul style="list-style-type: none"> <li>• Allows entire network and security management function visualization on a GIS map view for operator ease of use</li> <li>• Provides a color-coded state view, enabling a network operator to easily pinpoint network regions and devices to troubleshoot</li> <li>• Provides real-time troubleshooting using ping and traceroute with visual output on a GIS map, with primary metrics for each link, node, and endpoint</li> <li>• Provides geo tracking for mobile gateways based on GPS coordinates</li> </ul>
<b>Northbound API</b>	<ul style="list-style-type: none"> <li>• Allows ease of integration for existing applications, such as OMS, MDM, trouble-ticketing systems, and manager of managers</li> </ul>

**Table 2.** Supported gateways and endpoints

<b>Product name</b>	<b>Product ID</b>	
<b>Cisco 1000 Series Connected Grid Routers</b>	CGR1120/K9	CGR1240/K9
<b>Cisco 500 Series Wireless Personal Area Network (WPAN) Industrial Routers</b>	IR509UWP-915/K9 IR529WP-915S/K9 IR529UWP-915D/K9 IR529UBWP-915S/K9 IR529UBWP-915D/K9	IR510-OFDM-FCC/K9 IR510-OFDM-ANZ/K9 IR510-OFDM-BRZ/K9 IR530D-OFDM-FCC/K9 IR530S-OFDM-FCC/K9
<b>Cisco 1101 Industrial Integrated Services Router</b>	IR1101-K9 IR1101-A-K9	
<b>Cisco 800 Series Industrial Integrated Services Routers</b>	IR809G-LTE-GA-K9 IR809G-LTE-LA-K9 IR809G-LTE-NA-K9 IR809G-LTE-VZ-K9  IR807G-LTE-GA-K9 IR807G-LTE-NA-K9 IR807G-LTE-VZ-K9	<b>Dual LTE</b> IR829M-2LTE-EA-AK9 IR829M-2LTE-EA-BK9 IR829M-2LTE-EA-EK9 IR829B-2LTE-EA-AK9 IR829B-2LTE-EA-BK9 IR829B-2LTE-EA-EK9 IR829-2LTE-EA-AK9 IR829-2LTE-EA-BK9 IR829-2LTE-EA-EK9

Product name	Product ID	
		<b>Single LTE</b> IR829M-LTE-EA-AK9 IR829M-LTE-EA-BK9 IR829M-LTE-EA-EK9 IR829M-LTE-LA-ZK9 IR829B-LTE-EA-AK9 IR829B-LTE-EA-BK9 IR829B-LTE-EA-EK9 IR829GW-LTE-NA-AK9 IR829GW-LTE-VZ-AK9 IR829GW-LTE-GA-EK9 IR829GW-LTE-GA-ZK9 IR829GW-LTE-GA-CK9 IR829GW-LTE-GA-SK9 IR829GW-LTE-LA-*K9
<b>Cisco 819 Integrated Services Routers</b>	<b>Hardened</b> C819HG-U-K9 C819HG-S-K9 C819HG-V-K9 C819HG-B-K9 C819HG+7-K9 C819HGW+7-E-K9 C819HGW+7-N-K9 C819HGW+7-A-A-K9 C819HGW-V-A-K9 C819HGW-S-A-K9 C819HWD-E-K9 C819HWD-A-K9 C819H-K9 C819HG-4G-V-K9 C819HG-4G-A-K9 C819HG-4G-G-K9	<b>Nonhardened</b> C819G-U-K9 C819G-S-K9 C819G-V-K9 C819G-B-K9 C819G+7-K9 C819G-4G-V-K9 C819G-4G-A-K9 C819G-4G-G-K9
<b>Cisco 5900 Series Embedded Services Routers</b>	ESR 5921	
<b>Cisco IC3000 Industrial Compute Gateway</b>	IC3000-2C2F-K9	
<b>Cisco Wireless Gateway for LoRaWAN</b>	IXM-LPWA-800-16-K9	IXM-LPWA-900-16-K9
<b>Cisco Connected Grid Endpoint</b>	CGE	

**Table 3.** Supported head end routers

Product name	Product ID	
Cisco Integrated Services Routers	ISR3900	ISR4431 ISR4321
Cisco Aggregation Services Routers	ASR1002-X ASR1002	
Cisco Cloud Services Router	CSR1000V	

**Note:** IoT Field Network Director does not manage head end routers. It only monitors them for reachability and tunnel status.

**Table 4.** Supported third-party gateways and endpoints

Vendor	Product
Cohda Wireless	MK5 OBU MK5 RSU
Itron	OpenWay Riva ACT OpenWay Riva ACT Gateway OpenWay Riva ACT Extender OpenWay Riva BACT OpenWay Riva BACT Controller OpenWay Riva CAM1

## Cisco IoT Field Network Director License Product IDs

Table 5 lists subscription product IDs, and Table 6 lists perpetual product IDs.

**Table 5.** Subscription product IDs

Subscription PID	Description
IOTFND-SOFTWARE-K9	Top-level PID
IOTFND-EP-1K	IoT FND device license for managing 1000 endpoints
IOTFND-BEP-1K	IoT FND device license for managing 1000 battery endpoints
IOTFND-CGR1000	IoT FND device license for managing CGR1000 router
IOTFND-IR509	IoT FND device license for managing IR500 endpoints
IOTFND-IR1100	IoT FND device license for managing IR1101 router
IOTFND-IR800	IoT FND device license for managing IR800 router
IOTFND-IC3000	IoT FND device license for managing IC3000 gateway

Subscription PID	Description
IOTFND-C800	IoT FND device license for managing C800 router
IOTFND-LORAWAN	IoT FND device license for managing LoRAWAN gateway
IOTFND-EP-100	IoT FND device license for managing 100 endpoints
IOTFND-ESR5921	IoT FND device license for managing embedded software router

**Note:** Maintenance price and IOx license are included in the pricing with subscription PIDs.

**Table 6.** Perpetual product IDs

Perpetual PID	Description
IOT-FND	Top-level perpetual PID
R-IOTFND-K9	IoT FND RPM distribution for bare metal deployment without the database
R-IOTFND-V-K9	IoT FND OVA virtual machine distribution for RF mesh management with embedded Oracle database
R-IOTFND-VPI-K9	IoT FND OVA virtual machine distribution for gateway management
L-IOTFND-GIS-3YRS	License for GIS map
L-IOTFND-EP-1K	IoT FND device license for managing 1000 endpoints
L-IOTFND-BEP-1K	IoT FND device license for managing 1000 battery endpoints
L-IOTFND-CGR1K	IoT FND device license for managing CGR1000 router
L-IOTFND-IR509	IoT FND device license for managing IR500 endpoints
L-IOTFND-IR800	IoT FND device license for managing IR800 router
L-IOTFND-C800	IoT FND device license for managing C800 router
L-IOTFND-LORAWAN	IoT FND device license for managing LoRaWAN gateway
L-IOTFND-OPTIONKIT	IoT FND product license option for ordering additional device licenses outside of IOTFND

**Note:** Maintenance will need to be purchased separately with perpetual PIDs.

## Recommended hardware configuration

Tables 7 and 8 list recommended generic server hardware configurations for running Cisco IoT Field Network Director software and Oracle to manage up to 6 million endpoints in an AMI use case. For large-scale deployments, additional servers are recommended with the same profile up to a maximum of 11 million endpoints.

Furthermore, Cisco IoT Field Network Director software uses enterprise database servers to store configuration and state information either embedded in the software or as a standalone database, which can be Oracle for RF mesh management or Postgres and Influx for gateway management.



**Table 7.** Application server hardware requirements for routers and endpoints

Nodes (CGR1000 / endpoints)	CPU (virtual cores)	Memory (RAM GB)	Disk space (GB)
25 / 10,000	2	16	100
50 / 50,000	4	16	200
500 / 500,000	4	16	250
1,000 / 1,000,000	8	16	250
2,000 / 2,000,000	8	16	500
6,000 / 6,000,000	8	16	500

**Table 8.** Recommended Oracle DB server hardware configurations

Nodes (CGR1000 / endpoints)	CPU (virtual cores)	Memory (RAM GB)	Disk space (GB)
25 / 10,000	2	16	100
50 / 50,000	4	16	200
500 / 500,000	8	32	500
1,000 / 1,000,000	12	48	1,000
2,000 / 2,000,000	16	64	1,000
6,000 / 6,000,000	20	96	1,000

Tables 9 and 10 list recommended server hardware for gateway management of up to 50,000 industrial routers and 250,000 mesh endpoints.

**Table 9.** Recommended server hardware configuration for 50,000 industrial routers

Hardware server	Operating system	Hardware profile, software, and network connectivity requirements
<b>IoT Field Network Director application server software with embedded database</b>	Red Hat Enterprise Linux 7.4 or later	12 core CPUs: Intel® dual-core Xeon x5000 series with 64 GB RAM and 500 GB storage or more (15,000+ rpm)

**Table 10.** Recommended server hardware configuration for 250,000 mesh endpoints

Hardware server	Operating system	Hardware profile, software, and network connectivity requirements
<b>IoT Field Network Director application server software with embedded database</b>	Red Hat Enterprise Linux 7.4 or later	4 CPUs: Intel dual-core Xeon x5000 series with 32 GB RAM and 300 GB storage or more (15,000+ rpm)

## Recommended software packages

Table 11 lists the recommended FND software packages for different use cases. For Cisco resilient mesh deployment in AMI, DA, DR, and outdoor lighting, use the package with Oracle Enterprise DB. If deployment scale is larger than 6 million endpoints, additional InfluxDB Enterprise is required. For gateway management involving only industrial routers, industrial compute gateways, and LoRaWAN gateways, an OVA offers a simple way of getting the management system up and running.

**Table 11.** Recommended FND software package options for different use cases

Use case	Recommended software package
<b>Advanced Metering Infrastructure (AMI) and Demand Response (DR) with more than 6 million meters</b>	IoT FND RPM distribution for bare metal deployment (R-IOTFND-K9) plus Oracle Enterprise <sup>1</sup> and 2 nodes of InfluxDB Enterprise <sup>2</sup>
<b>AMI and DR with fewer than 6 million meters</b>	IoT FND RPM distribution for bare metal deployment (R-IOTFND-K9) plus Oracle Enterprise <sup>1</sup>
<b>Distribution Automation (DA)</b>	IoT FND RPM distribution for bare metal deployment (R-IOTFND-K9) plus Oracle Enterprise <sup>1</sup> IoT FND OVA virtual machine distribution with embedded Oracle Enterprise DB <sup>3</sup> (R-IOTFND-V-K9)
<b>Outdoor lighting</b>	IoT FND OVA virtual machine distribution with embedded Oracle Enterprise DB <sup>3</sup> (R-IOTFND-V-K9)
<b>Gateway/router management in transportation, utility, smart city (LoRa), and oil and gas with maximum of 10,000 gateways</b>	IoT FND OVA virtual machine distribution for gateway management (R-IOTFND-VPI-K9)

<sup>1,2</sup> Customer will need to purchase the DB and separate servers to run them.

<sup>3</sup> Oracle is included in the OVA. No additional license from Oracle is required.

## High availability

IoT FND is a critical application for monitoring and managing a connected grid. IoT FND High Availability (IoT FND HA) solutions address the overall availability of IoT FND during software, network, or hardware failures.

IoT FND provides two main levels of HA:

- IoT FND Server HA
- IoT FND Database HA

For high system throughput, high availability, server load balancing, and redundancy, we recommend having at least two servers running the Cisco IoT Field Network Director software application and two servers running the primary and secondary databases in replication mode.

## Cisco environmental sustainability

Information about Cisco's environmental sustainability policies and initiatives for our products, solutions, operations, and extended operations or supply chain is provided in the "Environment Sustainability" section of Cisco's 2018 [Corporate Social Responsibility](#) (CSR) Report.

Reference links to **information about key environmental sustainability topics** (mentioned in the "Environment Sustainability" section of the CSR Report) are provided in the following table:

Sustainability topic	Reference
Information on product-material-content laws and regulations	<a href="#">Materials</a>
Information on electronic waste laws and regulations, including products, batteries, and packaging	<a href="#">WEEE Compliance</a>

## Cisco Capital

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### For more information

For more information about the Cisco IoT Field Network Director, visit <https://www.cisco.com/go/fnd>.

For more information about the Cisco Field Area Network solution, visit <https://www.cisco.com/go/fan>.

For more information about the Cisco 1000 Series Connected Grid Routers, visit <https://www.cisco.com/go/cgr1000>.

For more information about the Cisco 500 Series WPAN Industrial Routers, visit <https://www.cisco.com/go/ir500>.

For more information about the Cisco 1101 Industrial Integrated Services Router, visit <https://www.cisco.com/go/ir1101>.

For more information about the Cisco 829 Industrial Integrated Services Routers, visit <https://www.cisco.com/go/ir829>.

For more information about the Cisco 809 Industrial Integrated Services Routers, visit <https://www.cisco.com/go/ir809>.

For more information about the Cisco IC3000 Industrial Compute Gateways, visit <https://www.cisco.com/go/ic3000>.

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For more information about the Cisco LoRaWAN solution and product, visit <https://www.cisco.com/go/lorawan>.

For more information about the Cisco 819 Integrated Services Routers, visit <https://www.cisco.com/go/m2m>.

## Document history

New or Revised Topic	Described In	Date
Revised message	<a href="#">Introduction</a>	11/25/2019
Added new devices supported and new product IDs	<a href="#">Tables 2, 3, 4, 5 and 6</a>	11/25/2019
Added information on Oracle DB server requirements	<a href="#">Table 8</a>	11/25/2019
Added recommended hardware configurations for 250,000 mesh endpoints	<a href="#">Table 10</a>	11/25/2019
Added recommended software packages	<a href="#">Table 11</a>	11/25/2019

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